

THE IMPACT OF TRAUMA ON THE BRAIN AND MIND/BODY

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THE SCIENCE OF TRAUMA
CONGRESSIONAL BRIEFING
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OUTLINE OF TALK

Impact of Trauma on the Brain

Principles of brain and behavioral development

- brain architecture

- serve and return

- air traffic control-executive function

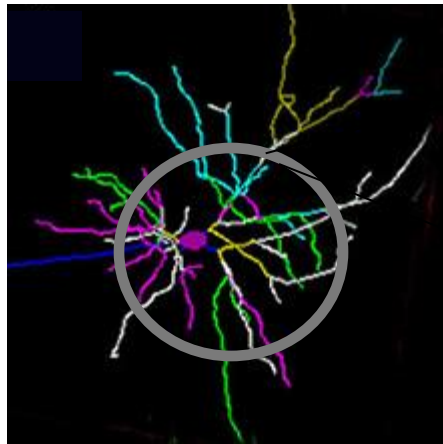
- toxic stress

- neglect

Implications for policy

Toxic Stress Changes Brain Architecture

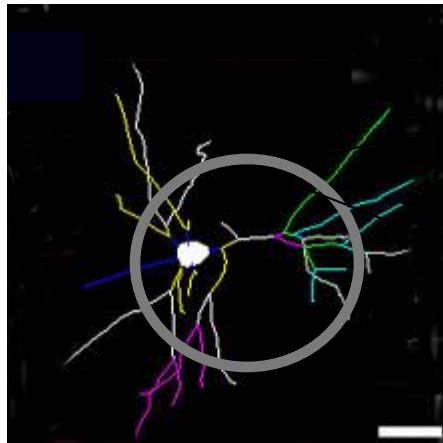
Normal



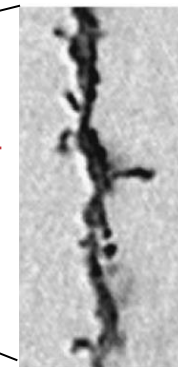
Typical neuron—
many connections



Toxic
stress



Damaged neuron—
fewer connections



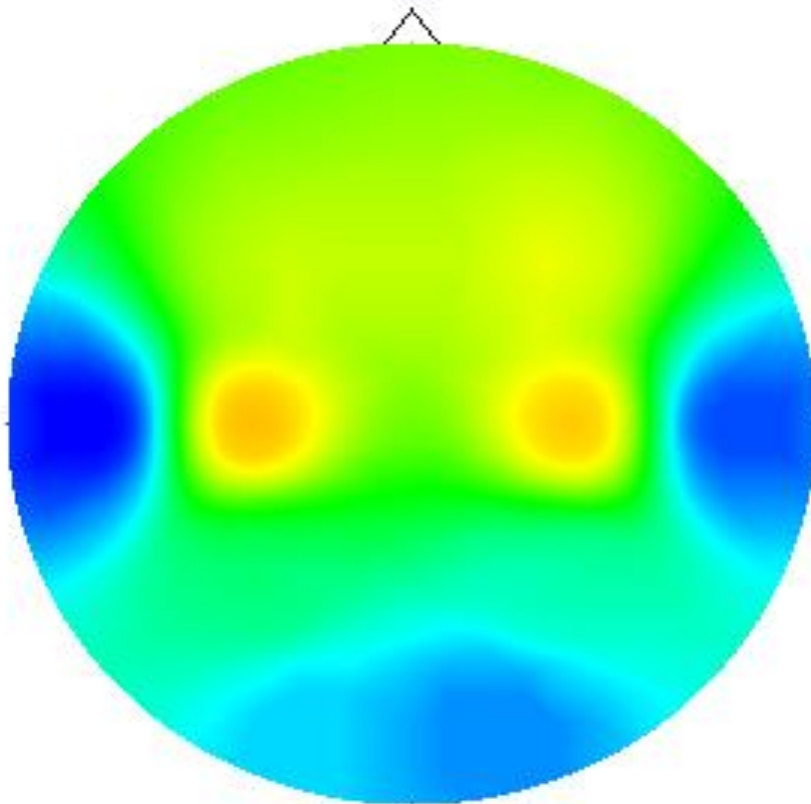
Prefrontal Cortex and
Hippocampus

Sources: Radley et al. (2004)
Bock et al. (2005)

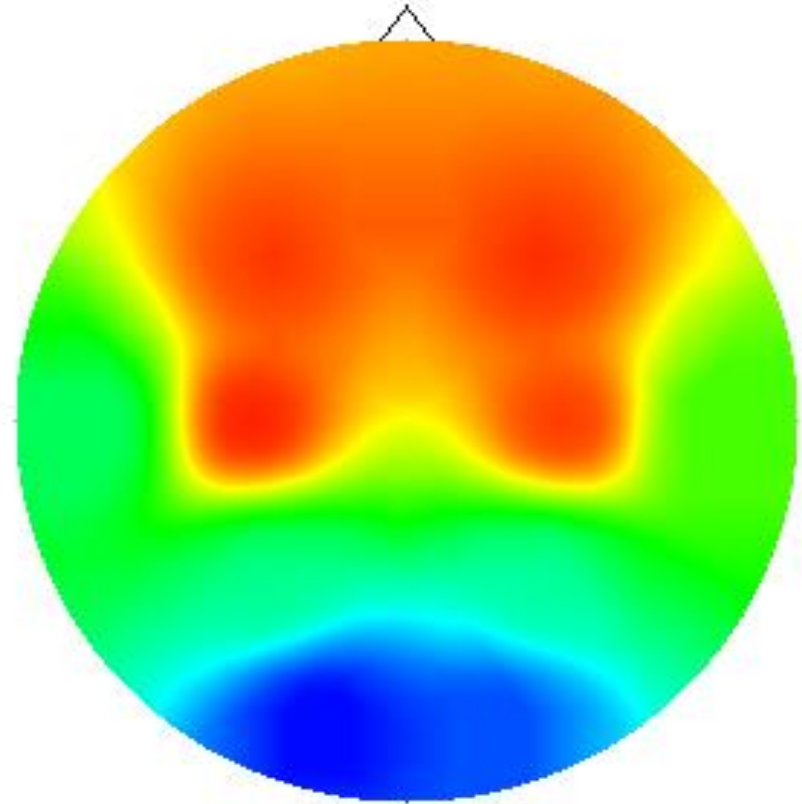
PSYCHOSOCIAL NEGLECT AFFECTS BRAIN ACTIVITY

Alpha, 6-9 Hz

Institution



Community



Proportion

0.58



0.46

Marshall, Fox & BEIP group (2007)

CORE PRINCIPLES OF BRAIN DEVELOPMENT

Brains are built over time

Positive Responsive Relationships are an integral part of Healthy Brain Development

Brain Development Does not End at Age 3---Important Changes Occur in the Preschool Period

Toxic Stress Can Derail Brain Development In Infancy and Beyond

Neglect is the most common form of maltreatment for children in the United States

Positive Supports and Responsive Relationships Can Buffer Stress

Brain Architecture Supports Lifelong Learning, Behavior, and Health

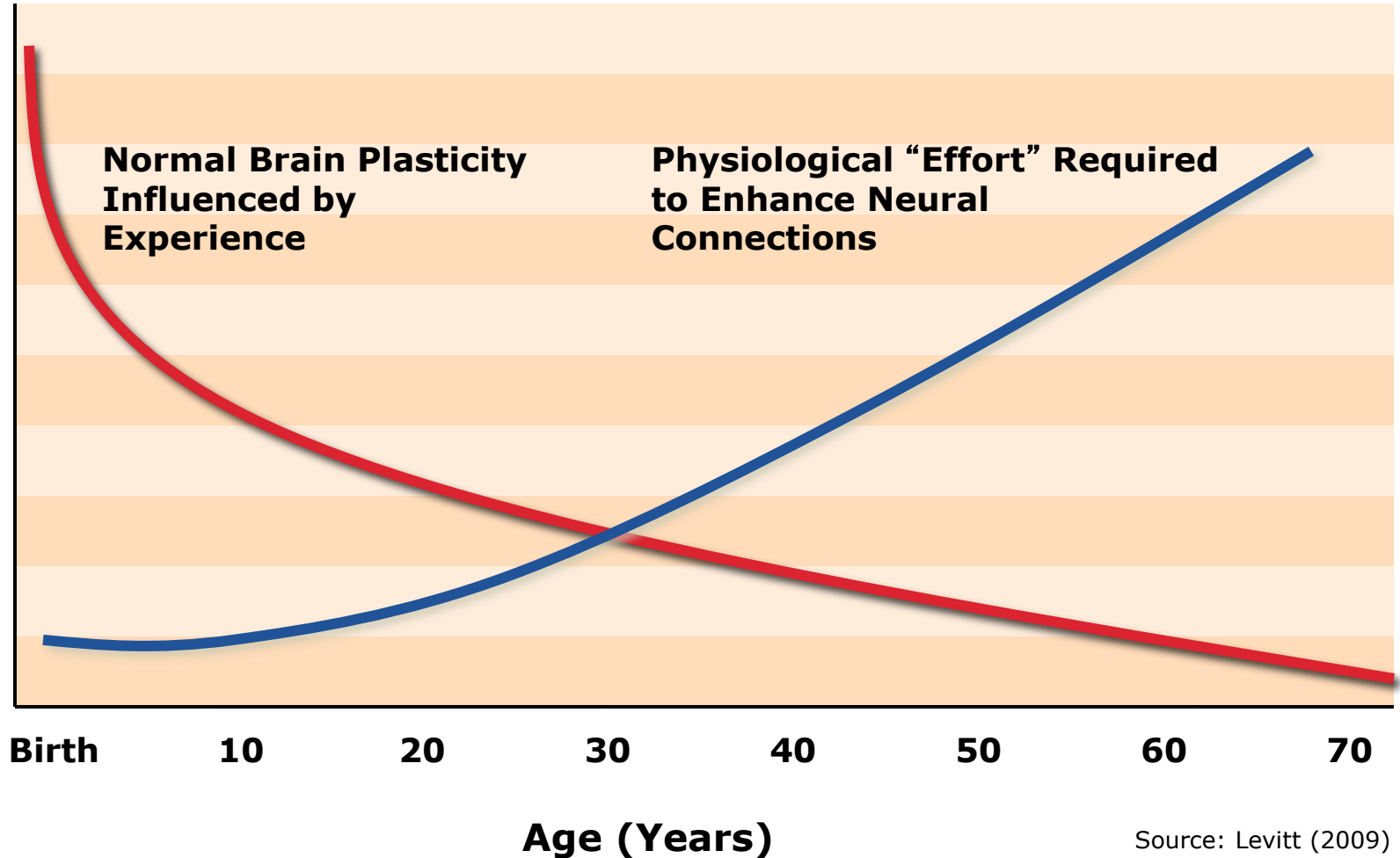
Brains are built over time, starting in the earliest years of life. Simple skills come first; more complex skills build on top of them.

Cognitive, emotional, and social capabilities are inextricably intertwined throughout the life course.

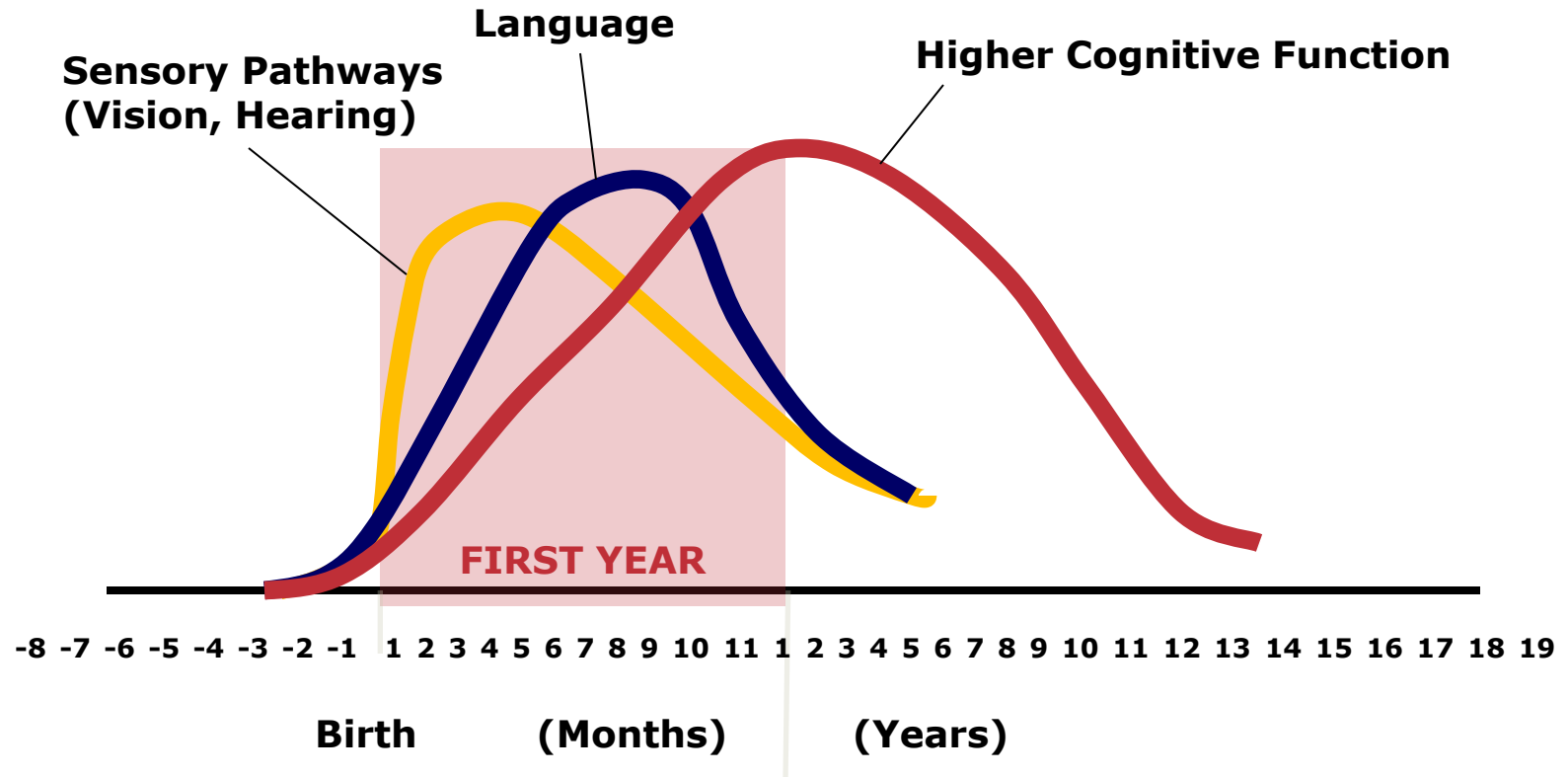


A strong foundation in the early years improves the odds for positive outcomes and a weak foundation increases the odds of later difficulties.

The Ability to Change Brains Decreases Over Time



Neural Circuits are Wired in a Bottom-Up Sequence



Source: C.A. Nelson (2000)

Experience Shapes Brain Architecture by Over-Production Followed by Pruning

(700 synapses formed per second in the early years)



birth

6 y

Serve & Return Builds Brains and Skills

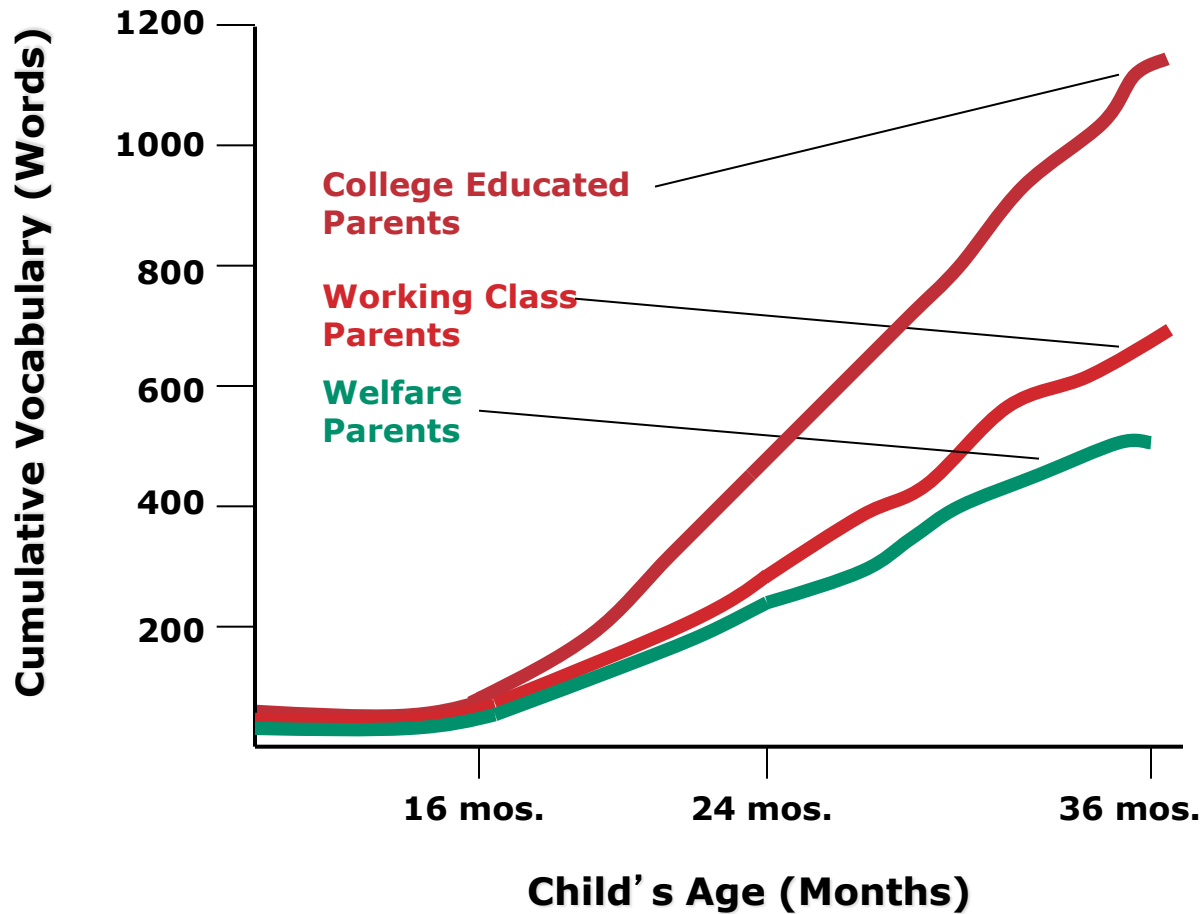
Young children naturally reach out for interaction through babbling, facial expressions, and gestures, and adults respond in kind.

These “serve and return” interactions are essential for the development of healthy brain circuits.



Therefore, systems that support the quality of relationships in early care settings, communities, and homes also support the development of sturdy brain architecture.

Barriers to Educational Achievement Emerge at a Very Young Age



Source: Hart & Risley (1995)

An “Air Traffic Control System” in the Brain



Executive functioning is a group of skills that help us to focus on multiple streams of information at the same time, set goals and make plans, make decisions in light of available information, revise plans, and resist hasty actions.

- a key biological foundation of school readiness as well as outcomes in health and employability

What are Executive Function Skills?

Inhibitory Control — filter thoughts and impulses to resist temptations and distractions



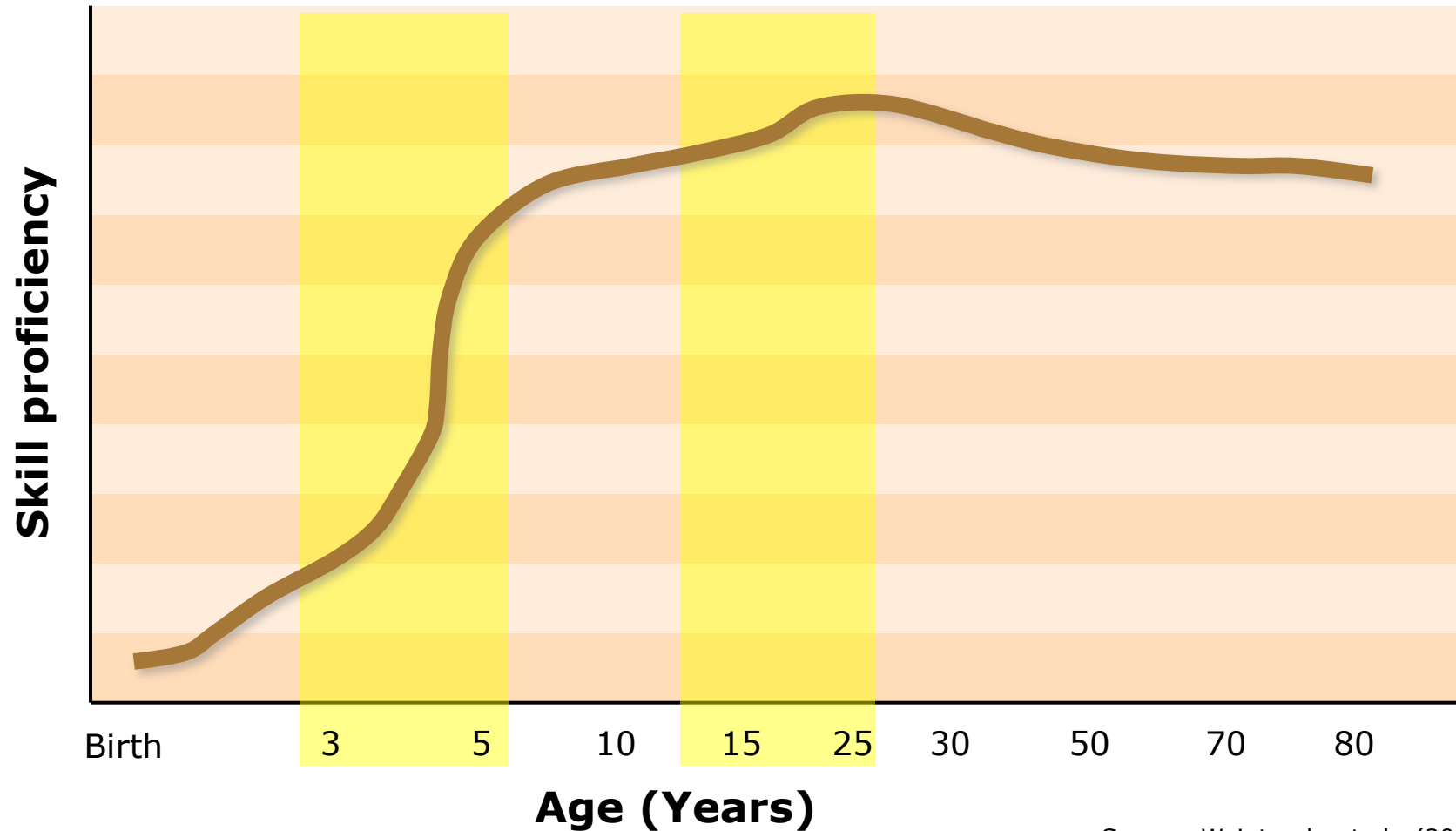
Working Memory — hold and manipulate information in our heads over short periods of time



Cognitive flexibility — adjust to changed demands, priorities, or perspectives



Developmental Opportunities for Executive Function Skills



Source: Weintraub, et al., (2011)

The Biology of Adversity: Three Levels of Stress



The diagram consists of three overlapping circles arranged vertically. The top circle is teal and labeled 'POSITIVE'. The middle circle is yellow and labeled 'TOLERABLE'. The bottom circle is red and labeled 'TOXIC'. Each circle overlaps with the one below it. To the right of each circle is a corresponding text description of that level of stress.

POSITIVE

Brief increases in heart rate,
mild elevations in stress hormone levels.

TOLERABLE

Serious, temporary stress responses,
buffered by supportive relationships.

TOXIC

Prolonged activation of stress response
systems in the absence of protective
relationships.

Brain Architecture Supports Lifelong Learning, Behavior, and Health

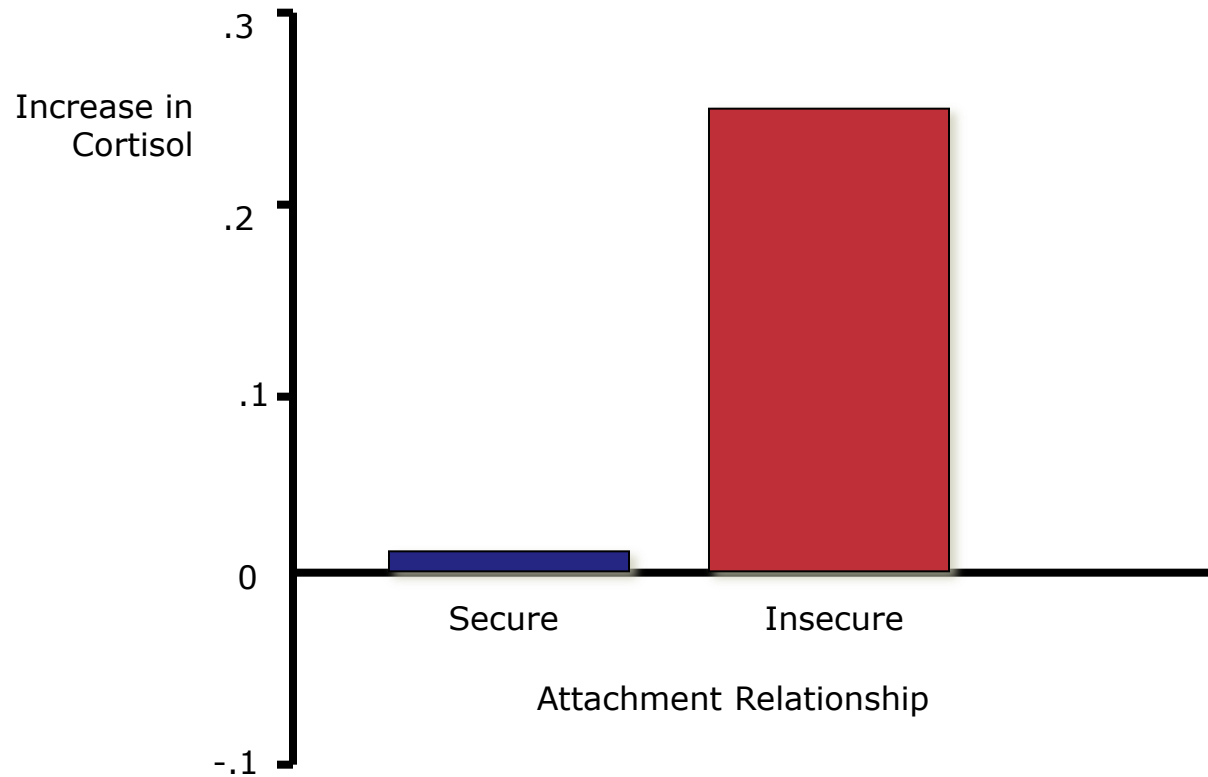
Learning how to cope with moderate, short-lived stress can build a healthy stress response system.

Toxic stress—when the body's stress response system is activated excessively—can weaken developing brain architecture.



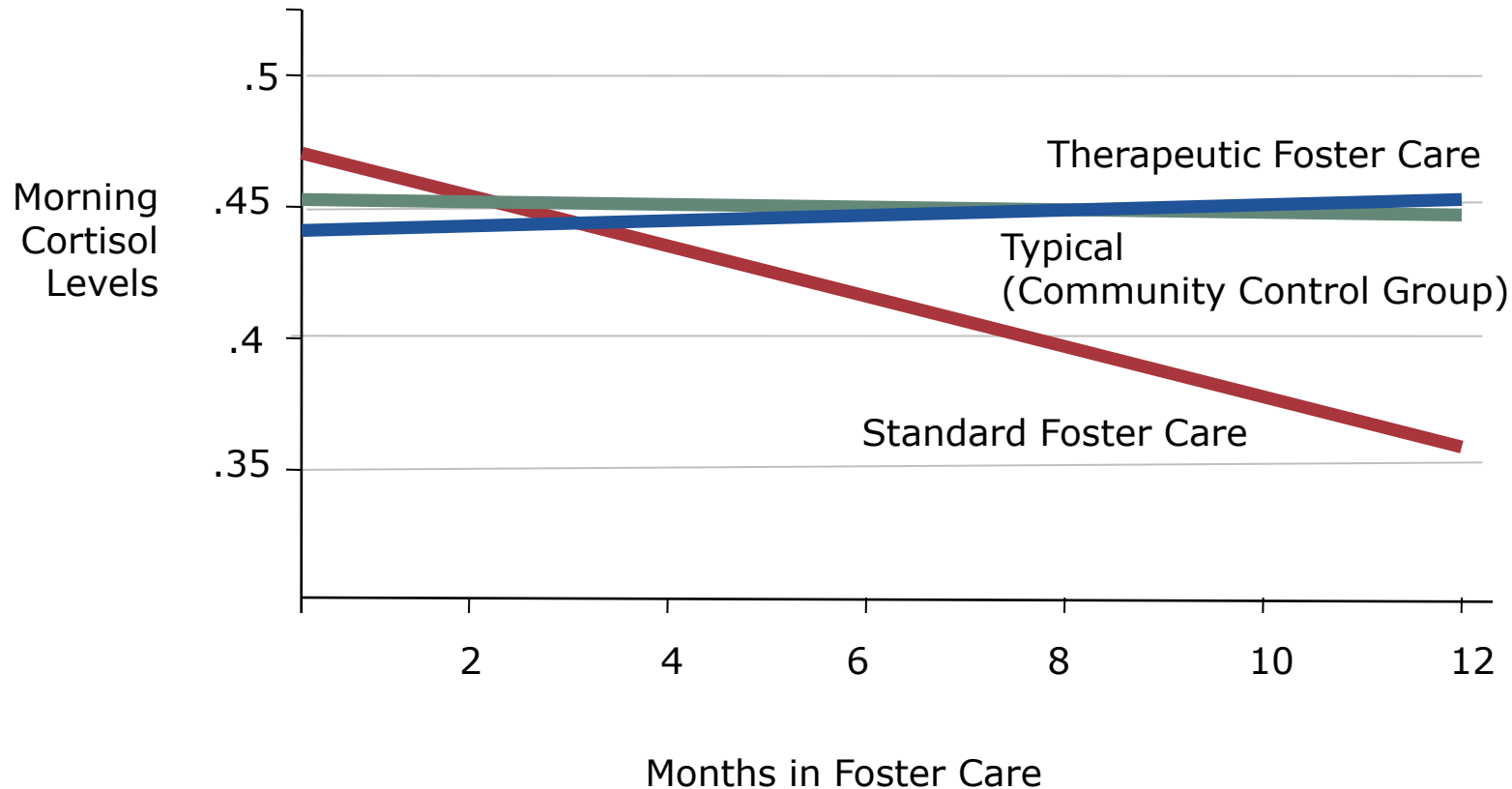
Without caring adults to buffer children, toxic stress associated with extreme poverty, neglect, abuse, or severe maternal depression can have long-term consequences for learning, behavior, and both physical and mental health.

Secure Relationships Calm Children's Stress Hormone Response



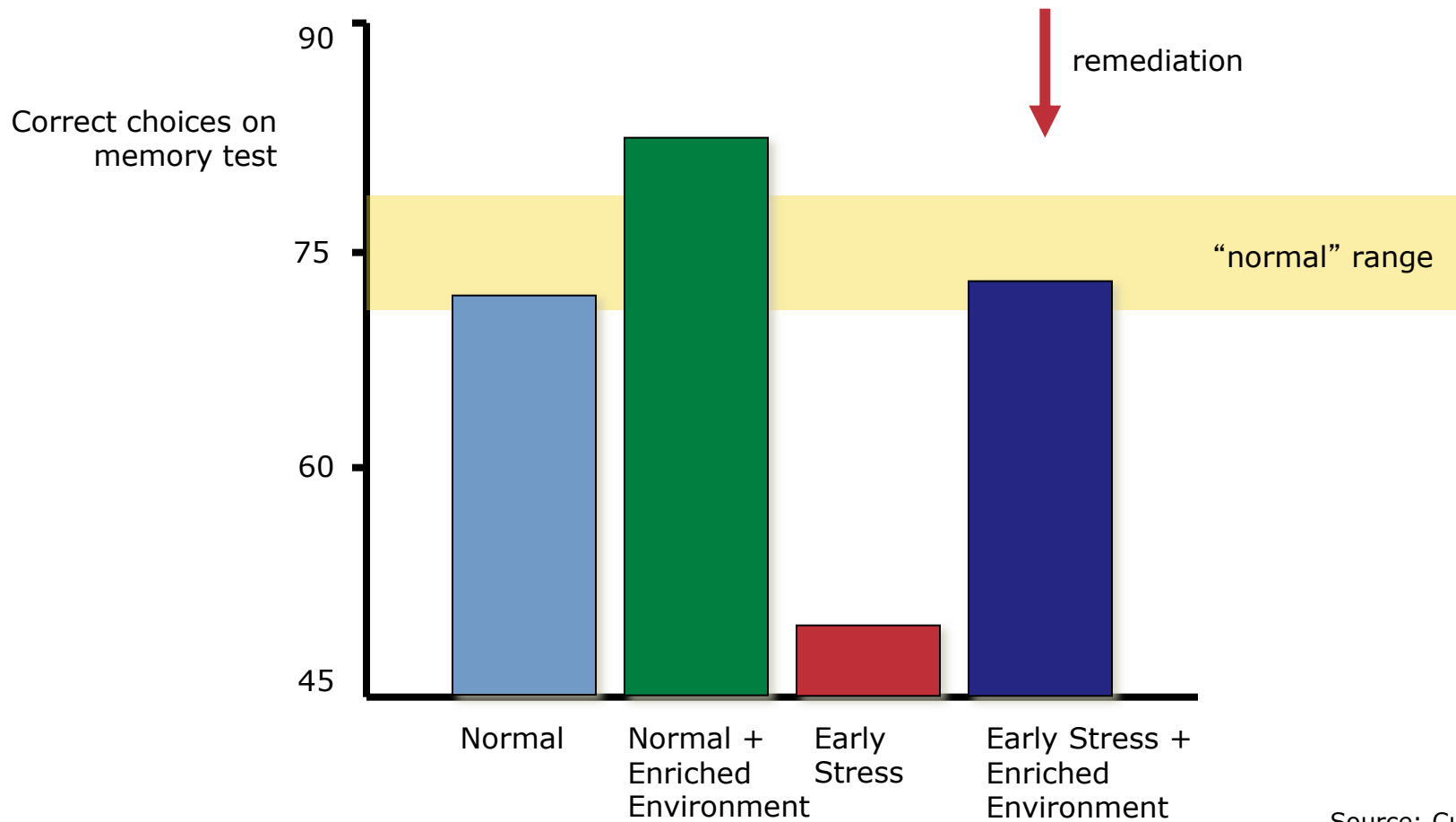
Source: Nachmias et al. (1996)

Instability Disrupts the Stress Response System — But Relationships Reverse the Effect



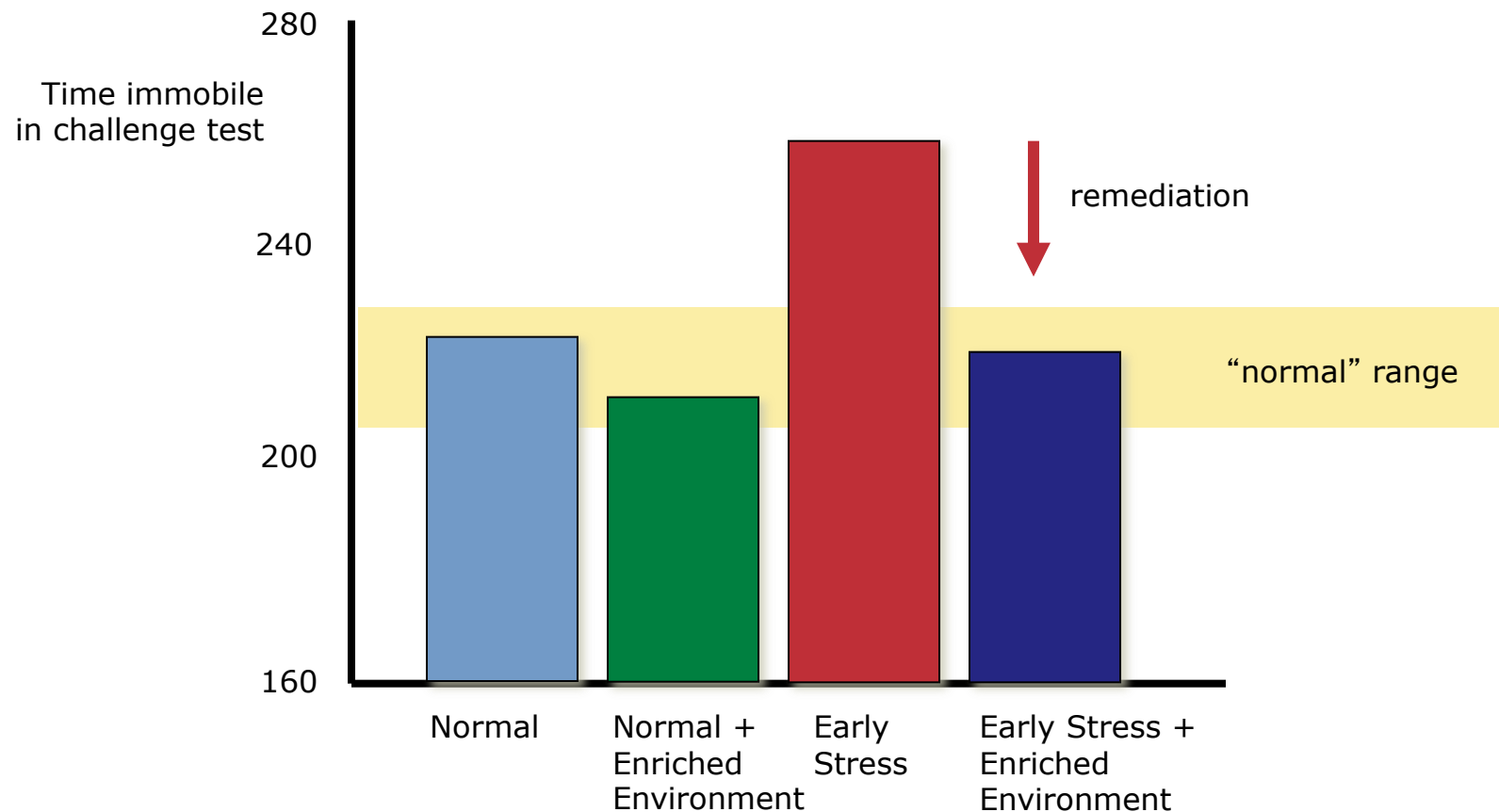
Source: Fisher, Stoolmiller & Gunnar (2007)

Early Enrichment Prevents Stress-Induced *Cognitive Disruption*



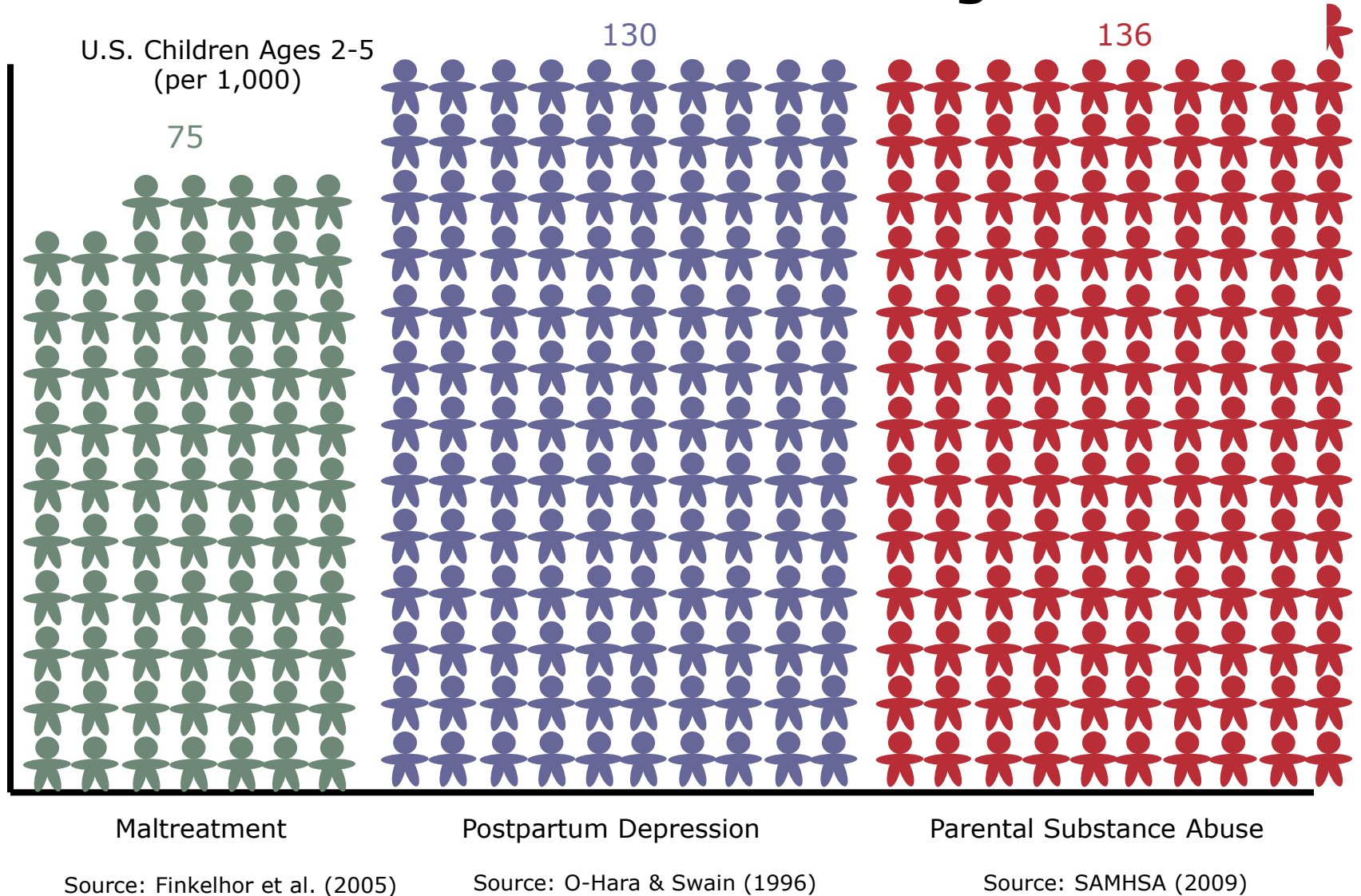
Source: Cui et al. (2006)

Early Enrichment Prevents Stress-Induced *Depressive-Like Behavior*

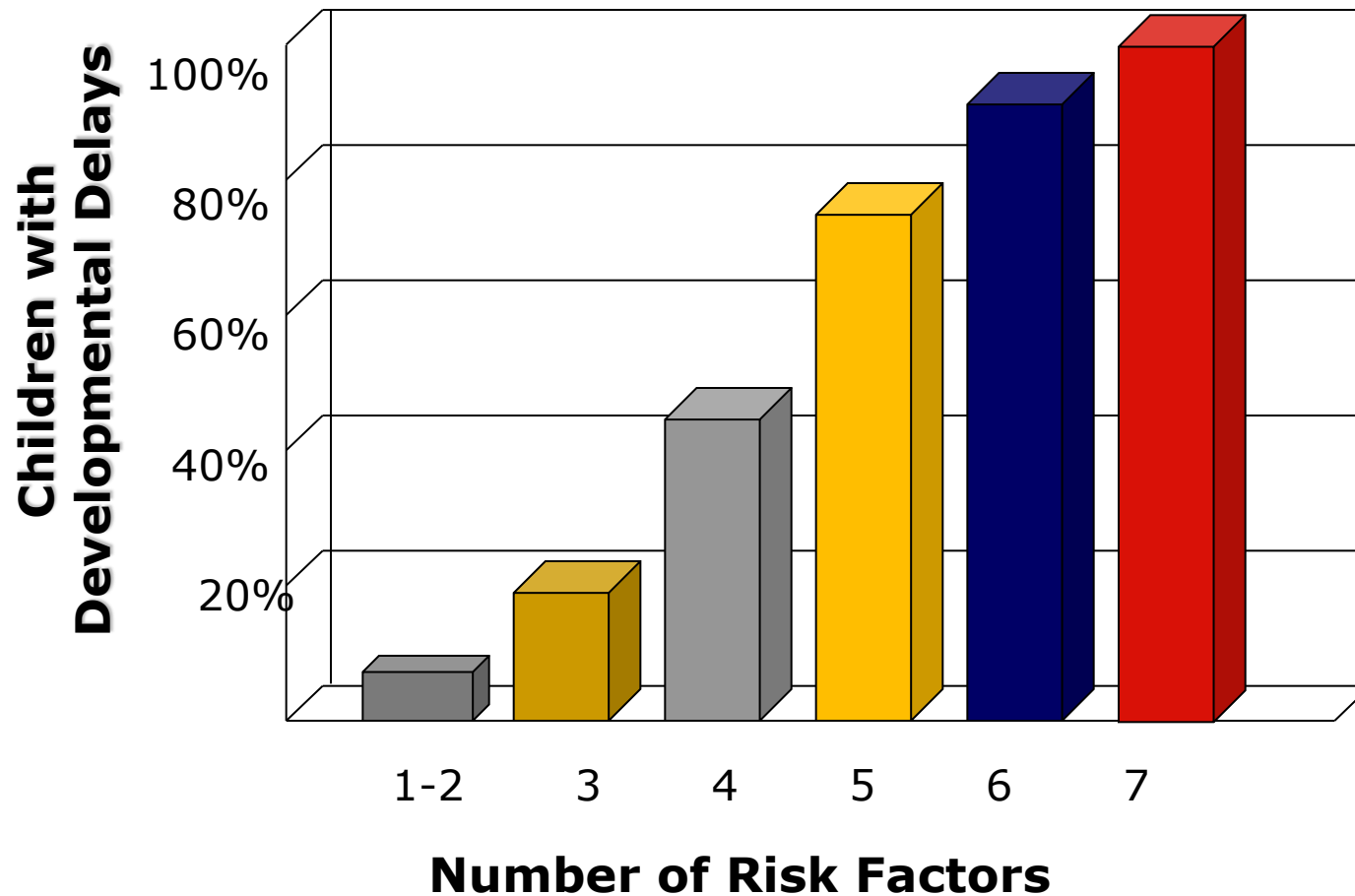


Source: Cui et al. (2006)

Sources of Toxic Stress in Young Children

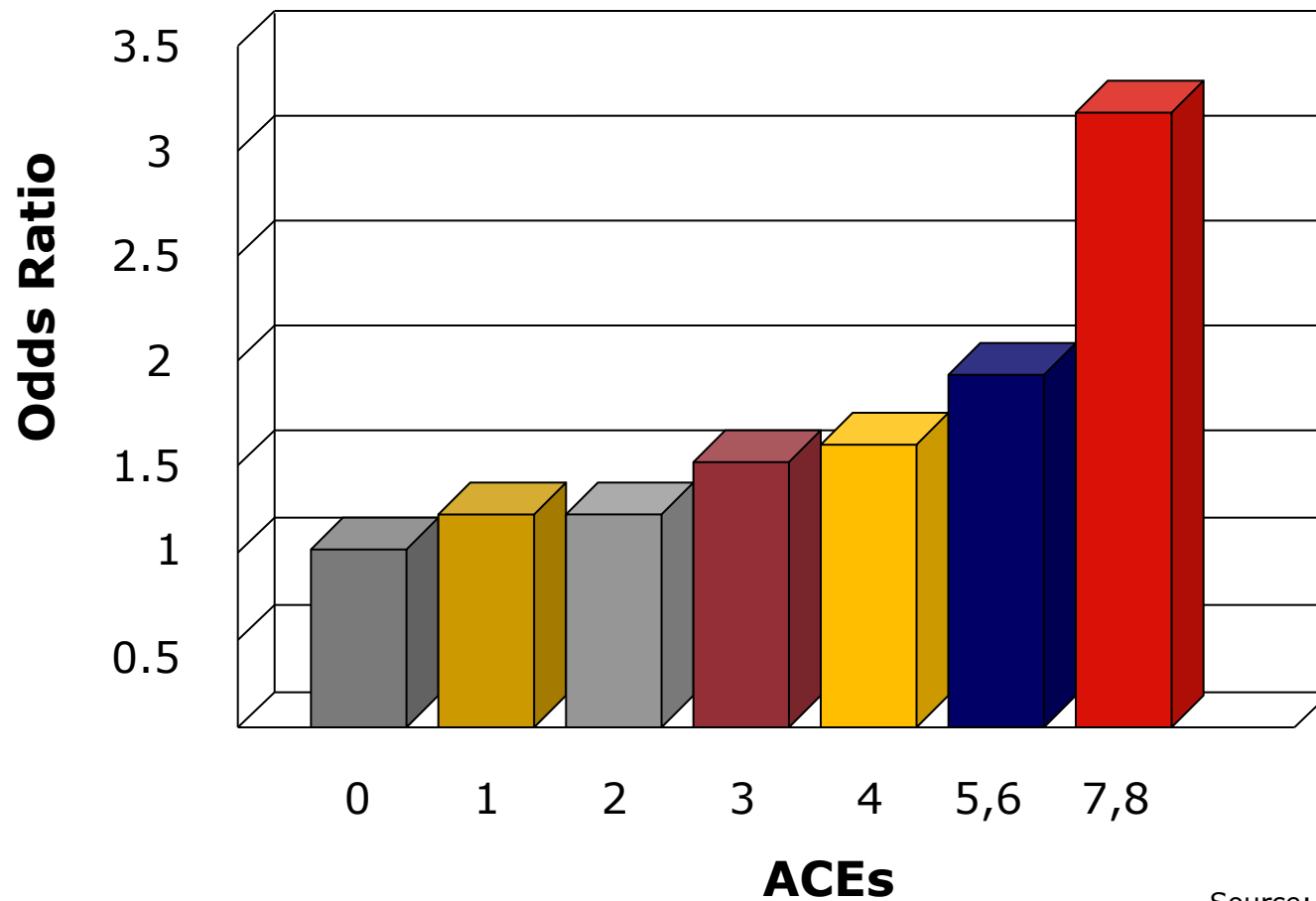


Significant Adversity Impairs Development in the First Three Years



Source: Barth, et al. (2008)

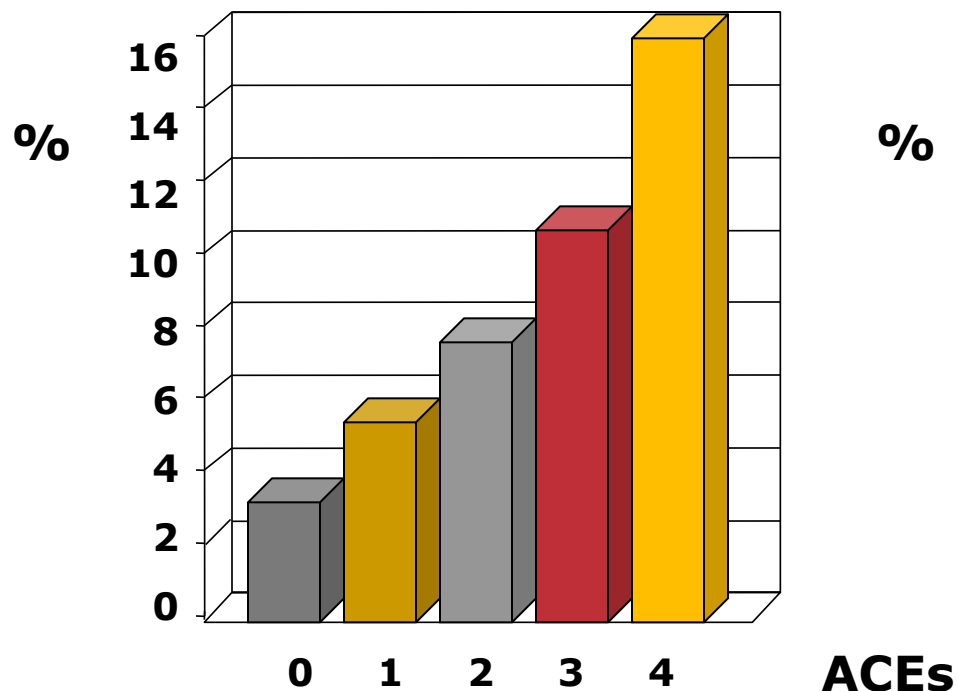
Risk Factors for Adult Heart Disease are Embedded in Adverse Childhood Experiences



Source: Dong et al, 2004

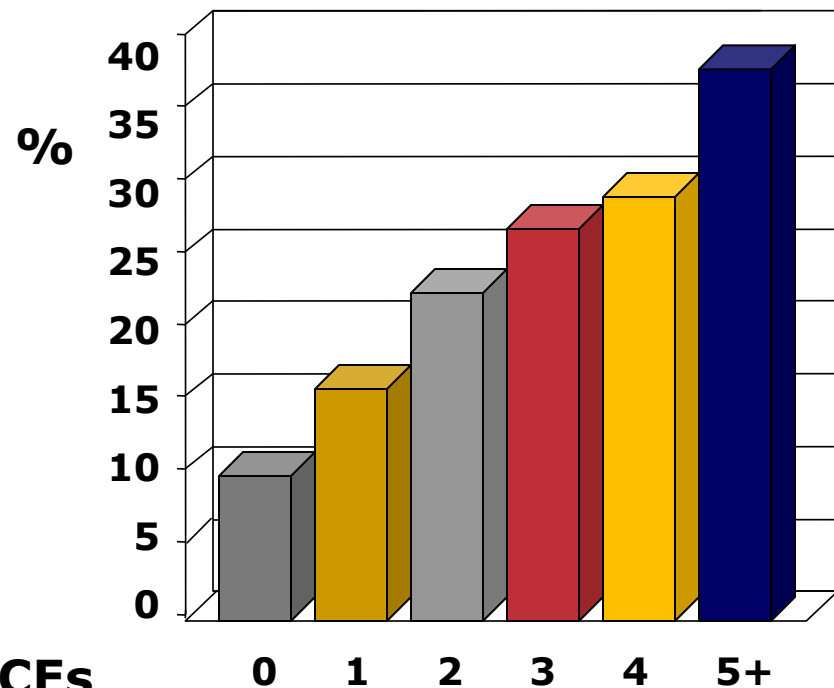
Risk Factors for Adult Substance Abuse are Embedded in Adverse Childhood Experiences

Self-Report: Alcoholism



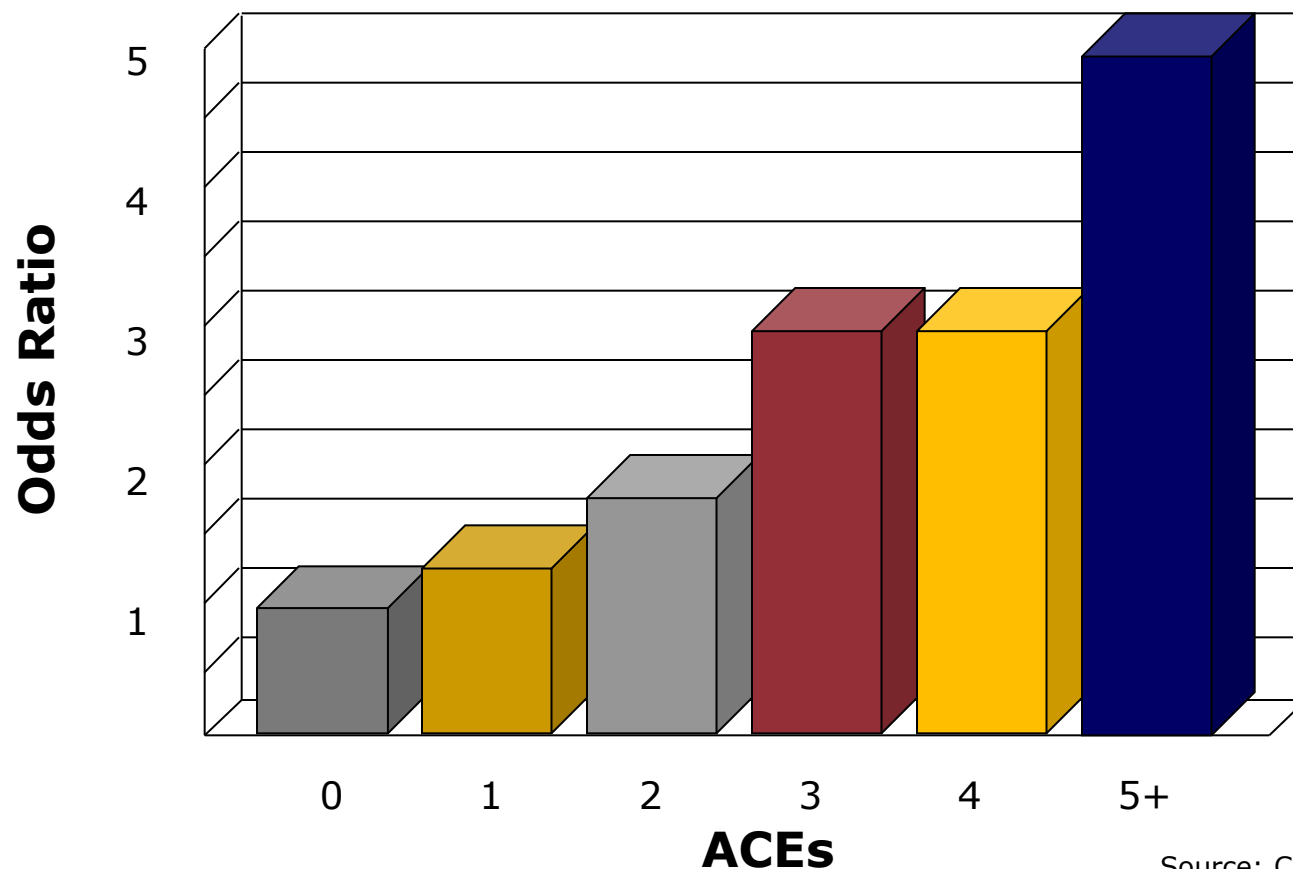
Source: Dube et al, 2002

Self-Report: Illicit Drugs

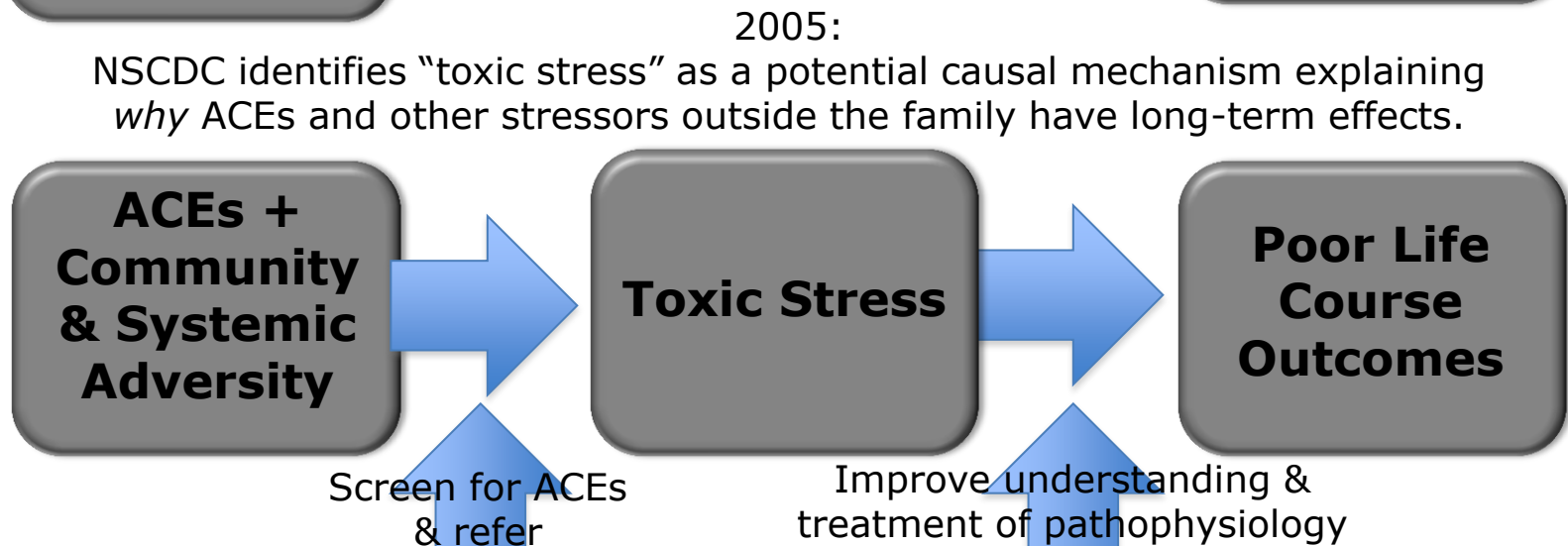
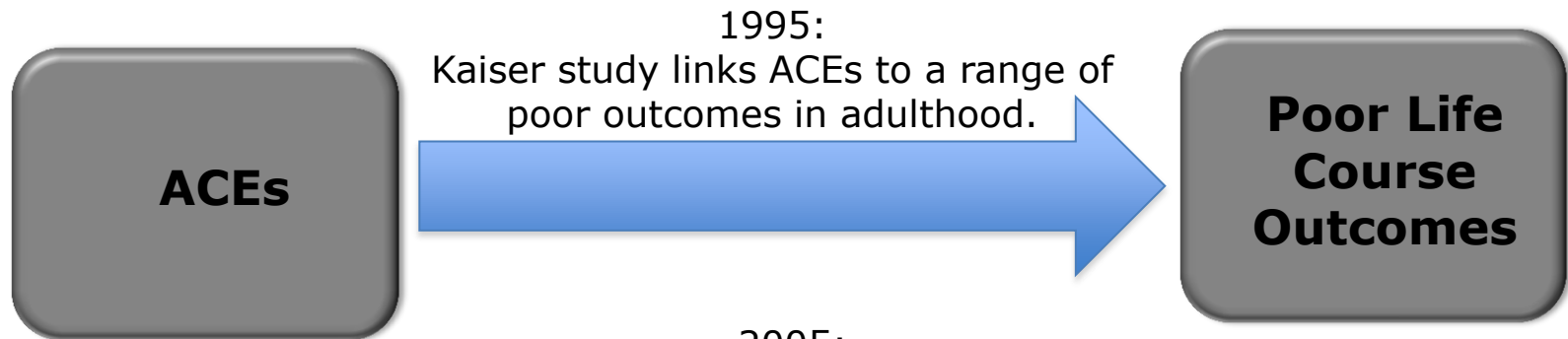


Source: Dube et al, 2005

Risk Factors for Adult Depression are Embedded in Adverse Childhood Experiences

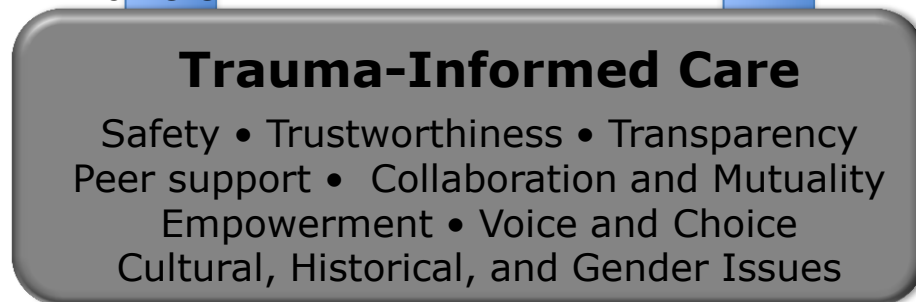


Source: Chapman et al, 2004



Screen for ACEs
& refer

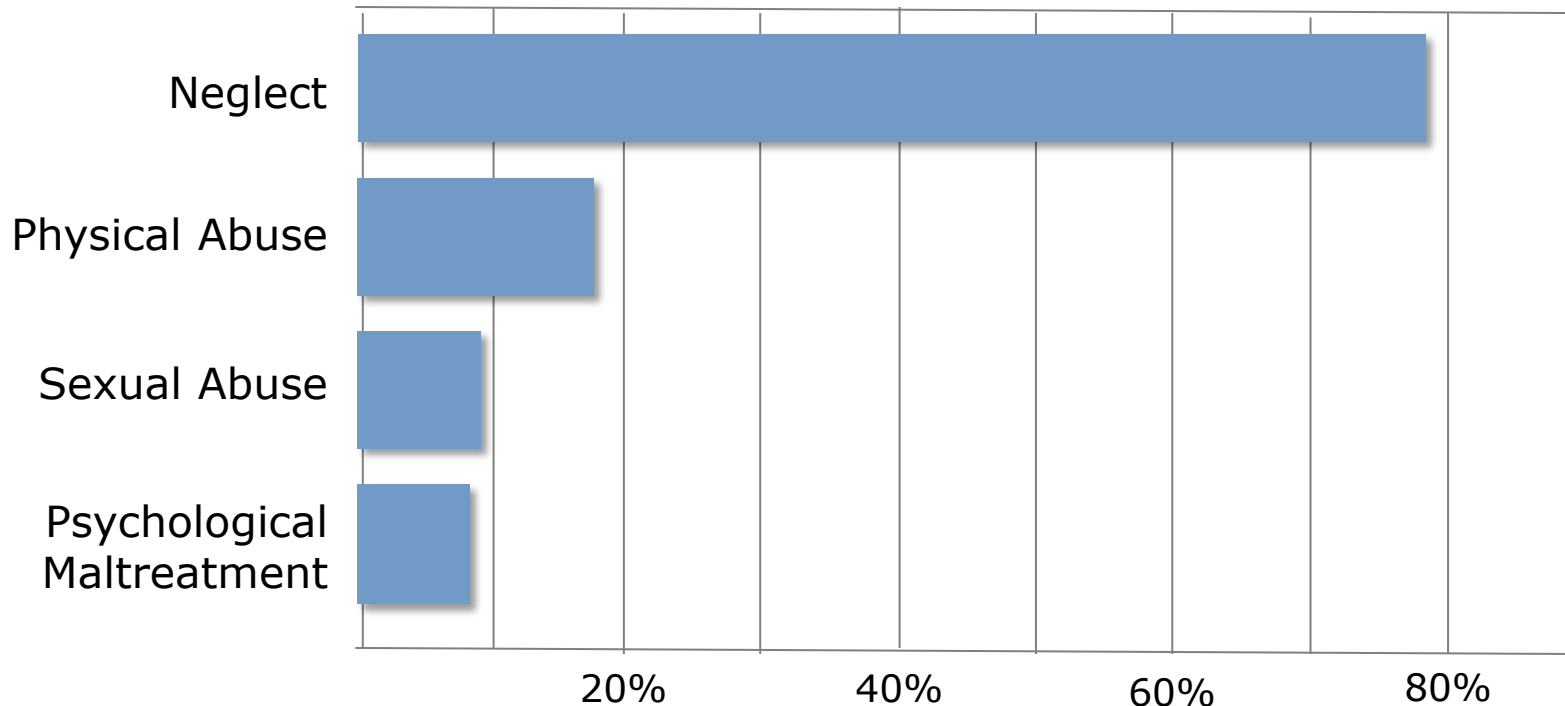
Improve understanding &
treatment of pathophysiology



2015:
An integrated framework for advancing the management of stress-related impairments in learning, behavior, and health?

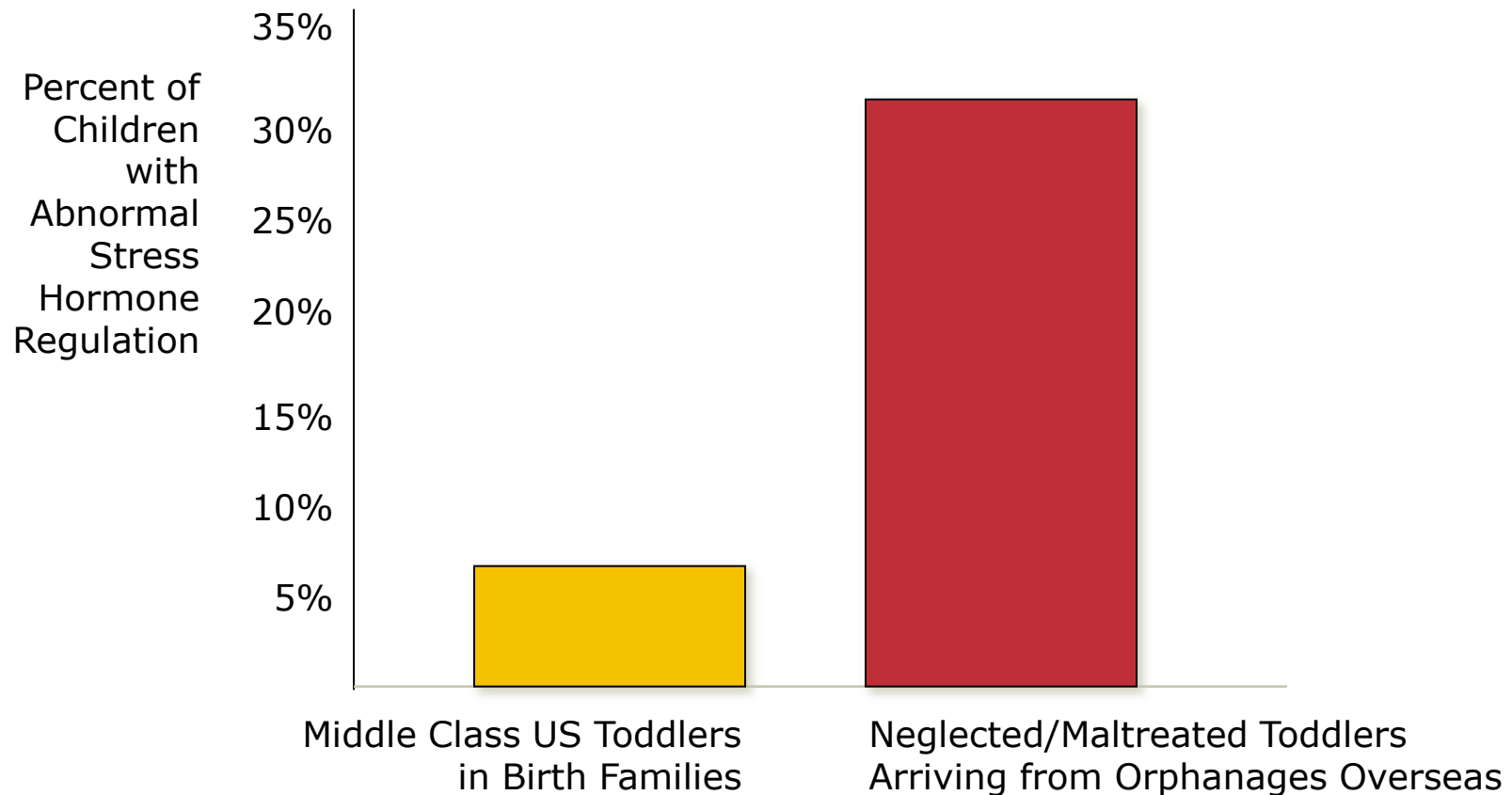
SCIENCE OF NEGLECT

Neglect is the Most Prevalent Form of Child Maltreatment



Source: U.S. Department of Health and Human Services (2010b).

Institutionalization and Neglect of Young Children Disrupts Stress Regulation

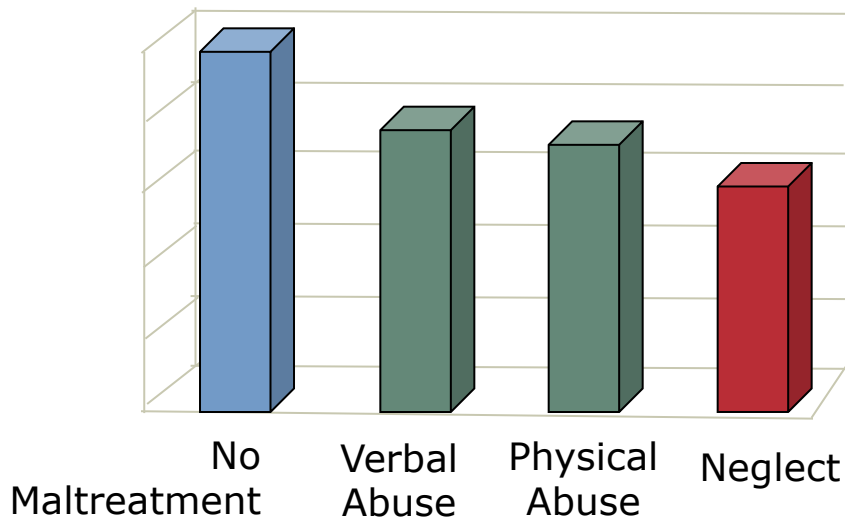


Source: Gunnar & Fisher (2006)

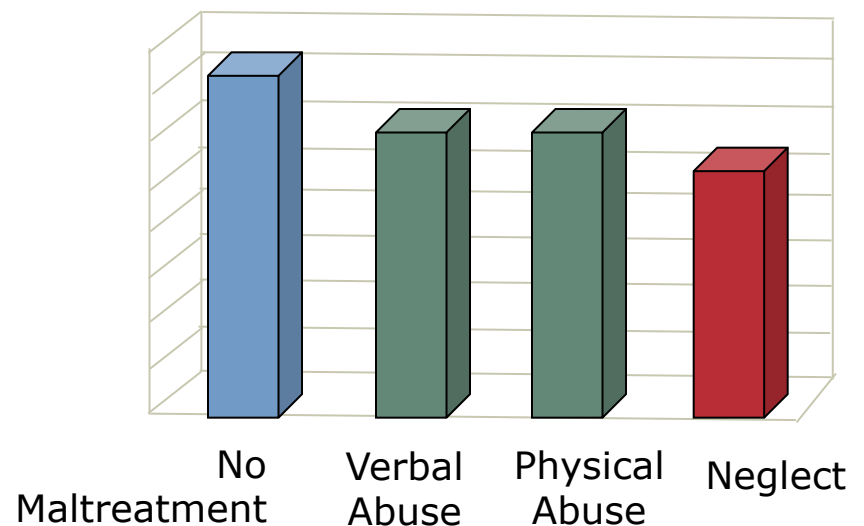
Neglect Can Be a Greater Threat to Development than Abuse

- More likely to have anxiety, depression, personality disorders
- More academic problems and special education referrals
- Lower IQ, poorer reading skills, less likely to graduate high school
- Poorer responses to frustrating situations

Creativity



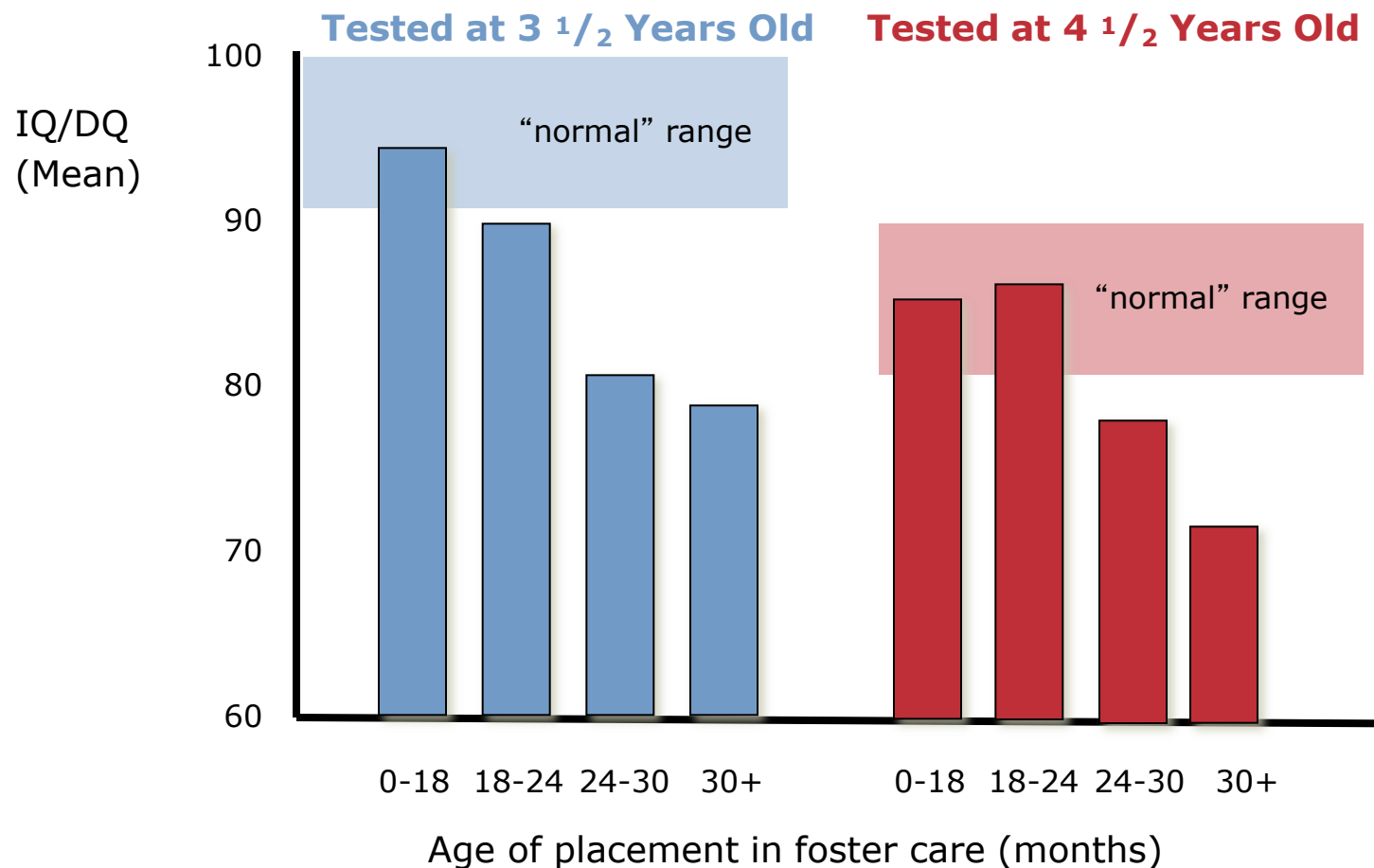
Confidence/Assertiveness



Source: Egeland, et al. (1983)

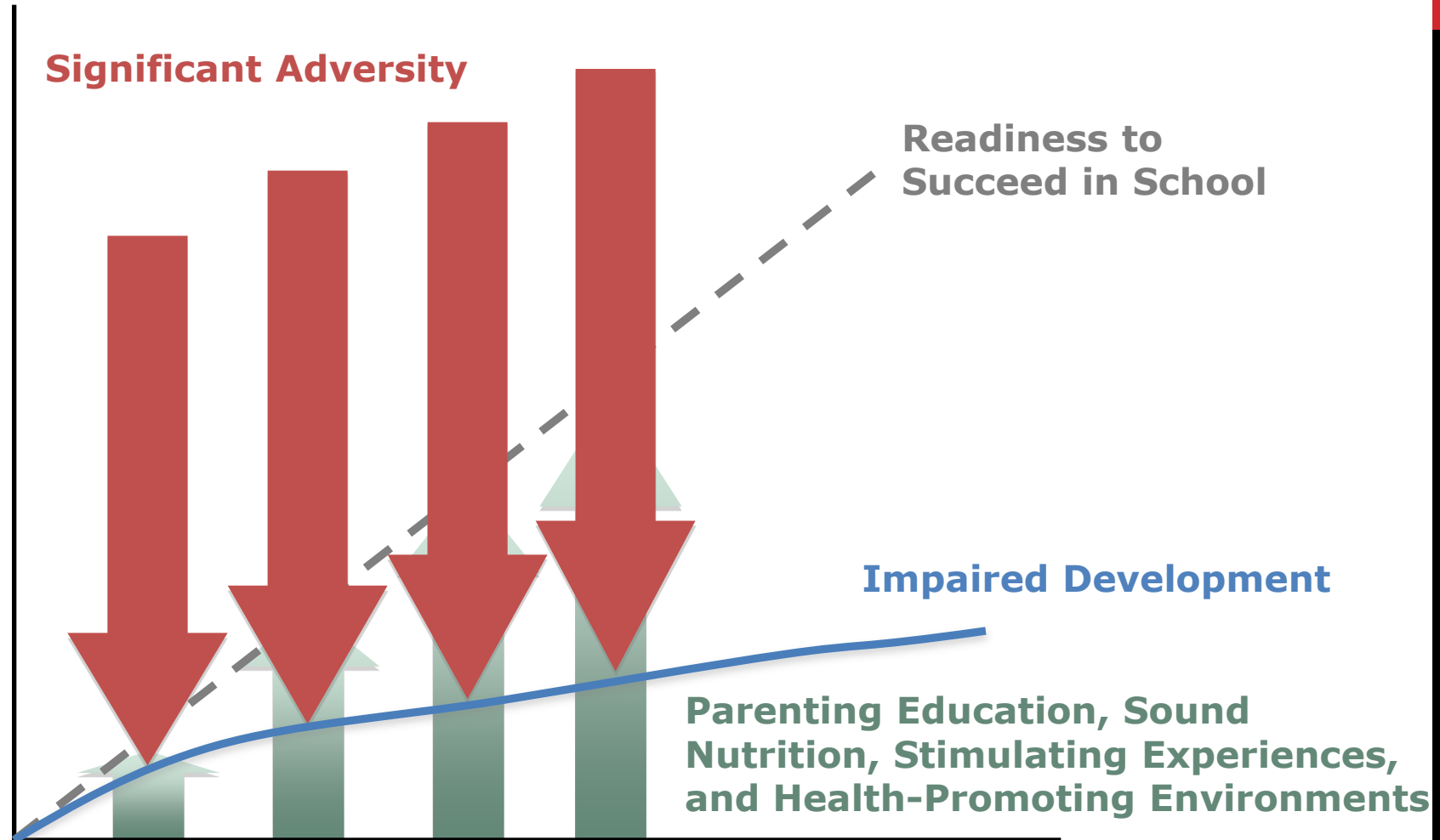
Prompt Provision of Responsive Relationships Restores Disrupted Development

Bucharest Early Intervention Program

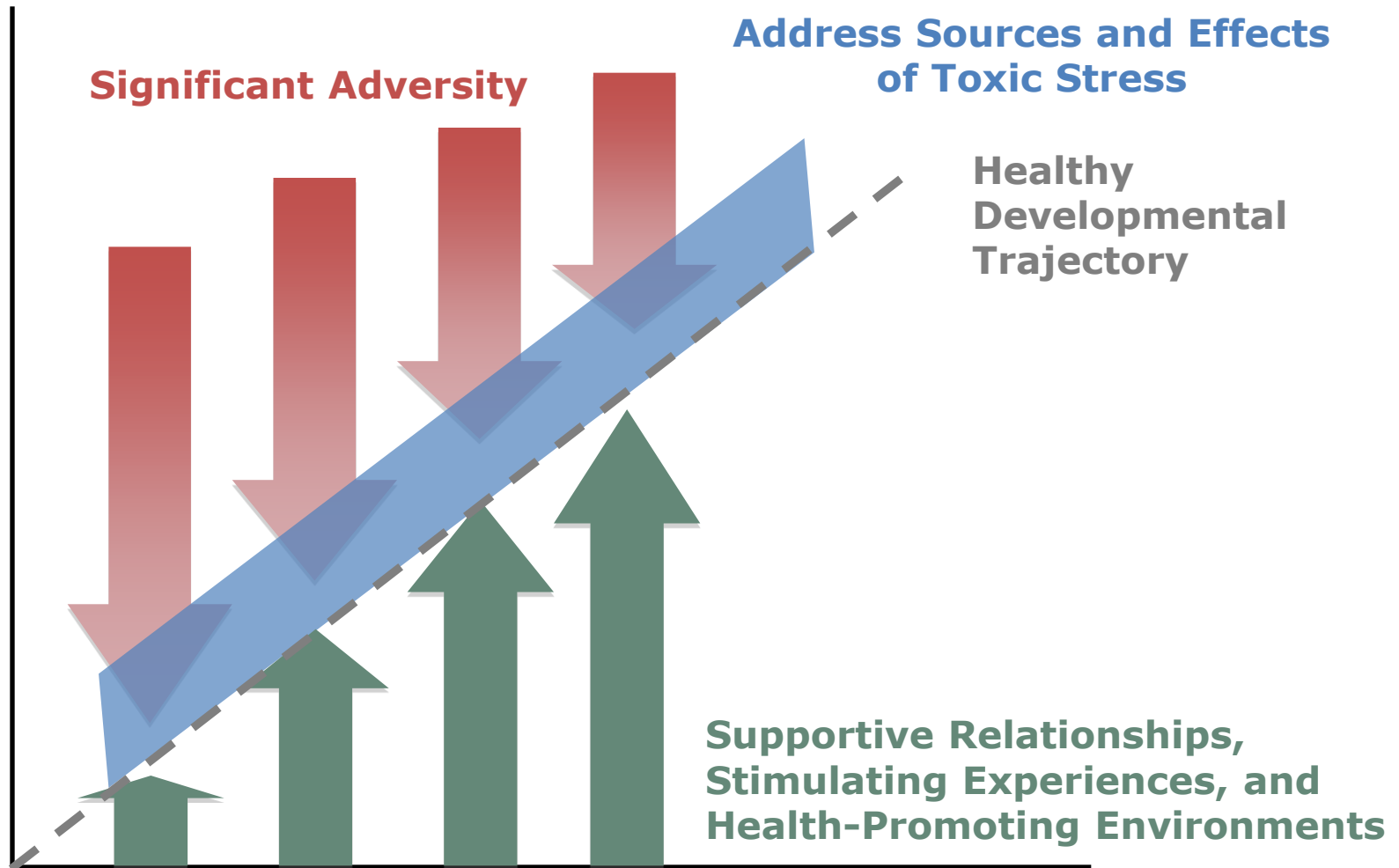


Source: Nelson et al. (2007)

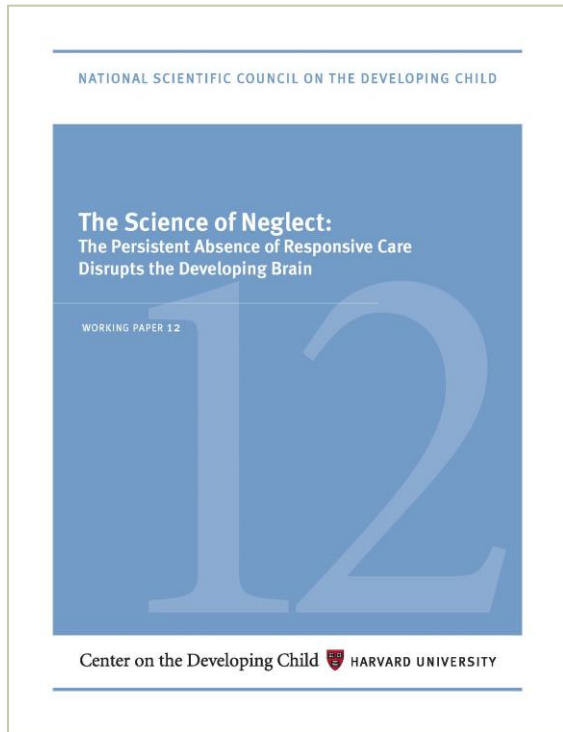
Current Conceptual Framework Guiding Early Childhood Policy and Practice



Designing an Enhanced Framework that Balances Enrichment, Prevention, and Protection



Addressing the Distinctive Needs of Children Exposed to Trauma including Serious Neglect



Increase public awareness and professional training for personnel in health services, early care and education, and child welfare.

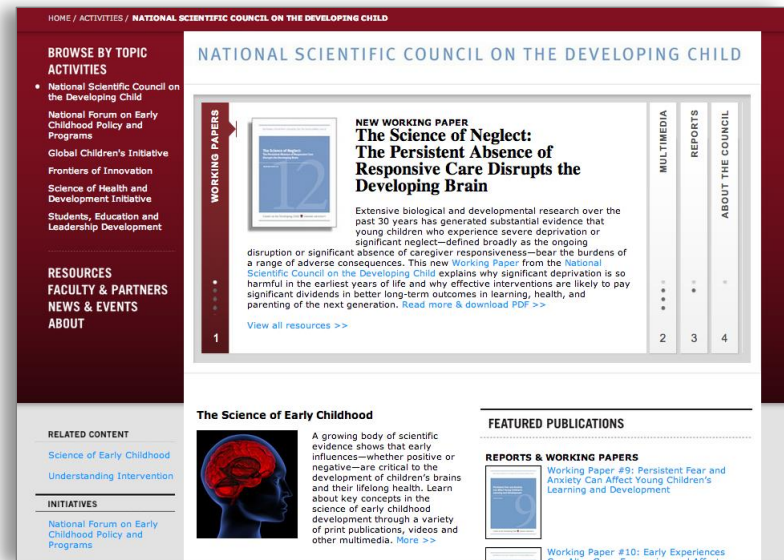
Coordinate efforts across sectors to identify vulnerable children and families as early as possible and improve access to services.

Develop more effective prevention programs in coordination with specialized services to address co-occurring medical, economic, and social needs.



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www.developingchild.harvard.edu

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